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FOREST INSECT PROBLEMS

OF THE

YELLOWSTONE NATIONAL PARK

by

JAMES C. EVENDEN
Associate Entomologist

Forest Insect Field Station
Coeur d'Alene, Idaho
October 22, 1924

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FOREST INSECT PROBLEMS OF THE YELLOWSTONE NATIONAL PARK

Introduction

Early in July 1924 Dr. Craighead, Forest Entomologist in charge of the Division of Forest Entomology, Washington, D.C., accompanied by the writer, spent a few days in the Yellowstone National Park studying existing forest insect epidemics. Later in July the writer returned and spent approximately two weeks in making examinations of infested timber and studying the spruce budworm and the pine sawfly and needle tyer epidemics. It is regretted that due to pressure of other work it was not possible to devote the time to these problems that their importance merits.

Spruce Budworm

Reference is made to the report, "Defoliation of Timber Stands within the Yellowstone National Park," submitted by the writer under date of October 5 1923, for a more detailed discussion of this problem.

The examination of different portions of the infested area made during the past season shows that the volume of timber killed has materially increased during the past year. It is estimated that throughout the heavily infested region from 50 to 75 per cent of the stand, which is nearly a pure Douglas fir type, has been killed. The devastation is more severe in the pure stands, some areas which were traversed for several miles being entirely destroyed. Though the destruction within this heavily infested area, which lies along the Yellowstone River between Blacktail Dear Creek and a point between Crescent and Garnet Hills, has been severest on the flats along the floor of the valley, it extends up all the tributary streams for variable distances and on the mountainsides to a certain elevation. This line of infestation on the mountainsides is believed to be not so much a question of elevation, as it varies in different parts of the area, but more possibly a change from a pure Douglas fir type to a mixed, or the effects of certain air currents upon the flight of the adult moths. Though the insects are above this line there have been but very few trees actually killed. However, it seems very doubtful that these areas will continue to remain immune from the destruction which has taken place on the lower levels, and as the infestation spreads these regions will no doubt be consumed.

Within this infestation area thousands of trees weakened by the spruce budworm defoliation are being attacked by the Douglas fir beetle (Dendroctonus pseudotsugae). This is parallel to the condition which occurred in the outbreaks of the spruce budworm in the eastern United States, where for several years following the defoliation the weakened trees were killed by secondary insects. Though at this time there are very few trees attacked by barkbeetles which would survive the budworm injury, during the next few years, in the wake of the epidemic, many trees will no doubt be killed by this secondary agency that would otherwise have recovered.

Recommendations

Spruce budworm larvae were found at Tower Falls Camp, Camp Roosevelt, and along the road from Camp Roosevelt to Mammoth Springs. In view of the possible damage that may occur in these regions it is recommended that in order to protect the scenic value of these places, the trees be sprayed during the coming season. This work should be completed soon after the terminal buds begin to open, which would prevent all injury to the trees for that season.

SAWFLY AND NEEDLE TYER EPIDEMIC

In the forests that surround the West Entrance of the Park, two insects, a sawfly and a needle tyer* have destroyed some 20-30 square miles of lodgepole pine within the past two or three years. The extent of the area infested is not known, but it is estimated to be from 75 to 100 square miles.

The larvae of the sawfly, which is an insect belonging to the same order as bees, wasps etc., feeds upon the old foliage, while the caterpillars of the leaf tyer, a small moth, destroy only the new growth. The sawflies are so named because the adult females have a pair of saw-like appendages at the tip of the abdomen. These saws are used to make slits in the leaves or needles in which the eggs are placed. The eggs of the needle tyer, which could perhaps be called a needle miner as well as a tyer, are laid upon the needles. The larvae which hatch from these eggs bore into and mine from half an inch to the entire length of the needle, leaving only the outer shell. During the middle of the summer these larvae emerge from these mines and pull together from 4 to 10 or more needles, which they cement on the inside with a fine silken material into a bundle. These bundles constitute the food supply as well as the nests of the insect. However, only the inside of these bundles is eaten, leaving the shell of the outer portion of the outside needles. The combined attacks of these two insects, one destroying the old and the other the new foliage, results in a complete defoliation and in most cases the death of the tree.

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*Adults of these insects have not been secured for identification.

The question as to which one of these insects is primary, or rather of the most importance, is rather difficult to answer. Places were found where both these insects were working alone, and there was little to choose from in the severity of the two attacks. The timber destroyed has for the most part been confined to reproduction, the larger trees seeming to have escaped the severe defoliation. The devastated area lies mostly within the park boundary, but during the past year the infestation has spread westward into the Madison National Forest, where the defoliation was very severe.

Control

The control operations that were instituted against these two insects is a matter of history, so but a brief mention of it need be made in this report, except to discuss the results obtained. To protect the scenic values of the roadside leading into the Park from the West Entrance a high-power sprayer was secured by the National Park Service from the Bureau of Entomology. With this machine a strip varying in width from 150 to 200 feet was sprayed on both sides of the road from the West Gate to the five-mile post.

A crew of six men, which included a nozzleman, a pumpman and four hoseman was required to operate this machine. During the later part of this work an auxiliary motor-driven water tank was added to this equipment, which materially expedited the work. As the tank on the sprayer, even when working under low pressure, is emptied in fifteen minutes, more than half the time of the crew is lost while the machine goes to the water supply, fills the tank and returns to the field, if operating without an auxiliary water carrier. Even with the one water tank, which held but two spray tanks full of water, from one-half to three-quarters of an hour was lost while this auxiliary was being refilled at the river. A greater efficiency would be secured if two such water carriers were provided, even though they were able to provide more water than needed,,in order to keep the sprayer running at its maximum time.

From a viewpoint of controlling this insect epidemic the small amount of spraying done was practically useless;.however, it was very successful in protecting the trees treated from this year's defoliation, which would have resulted in the death of a very large per cent of them. All the sawflies on the treated trees and from 80 to 95 per cent of the needle tyers were killed. An examination of the trees on September 9 showed them to be in very good condition.

The destruction of the needle tyers would have been as thorough as the sawflies had the spray been applied a week or ten days earlier, as many of the larvae had emerged from the needles and constructed nests, into which the spray did not penetrate. As the poison adheres to the needles for a period of several weeks, it would seem advisable to complete the spraying operation just about the time that the sawfly eggs were hatching. This would prevent all feeding of the sawfly larvae and result in a greater mortality of the needle tyers.

It is believed that with a season parallel with the past summer, the operation should be completed by the 20-25 of July which was the time that the work started this year. Trees which were sprayed on July 30 were examined on September 9, and the needles still showed sufficient evidence of the poison, which it is believed would destroy any insect feeding upon them.

The areas treated during the past season will ofccourse need to be sprayed again during the coming season, as reinfestation is bound to occur from the untreated tracts which lie but a few feet away. It is not known how much further it will be necessary to spray along the roadside, nor can this be determined until after the emergence of the adults next June and the trees are examined for eggs. Sawfly larvae were found in limited numbers at Madison Junction, and it is possible that the infestation at this point will have increased to such an extent that spraying will be necessary.

The possibility of destroying the overwintering pupae, which lie just under the loose duff, by light burning, was thoroughly discussed by representatives of the National Park Service, Forest Service, and the writer. The plan was abandoned because of the expense of such an operation, the uncertainty of results, and the tremendous area that would have to be burned in order to reach the limits of the infestation. The problem of treating the entire infested area by dusting poison from an airplane is being handled by Dr. Craighead, Washington,D.C.

YELLOWSTONE LAKE INFESTATION

An examination of an area on Yellowstone Lake, where it was reported that the timber was dying, was made August 10, 1924. It was found that in a mixed forest type of Engelmann spruce, alpine fir, white bark pine and lodgepole pine, which lies on and to the east of Frank Island, from 60-70 per cent of the mature spruce and a large per cent of the fir had been killed by barkbeetles during the past five years.

The insect responsible for the death of the Engelmann spruce is the Engelmann spruce beetle (Dendroctonus engelmanni), while the fir is being killed by a smaller barkbeetle of the genus Dryocoetes (possibly Dryocoetes confusus). In the area examined there was very little new work recorded. Though there were several spruce trees that were attacked by the Engelmann spruce beetle in 1923, and from which the new adults had emerged, no newly attacked (1924) trees were located. The 1924 attack of the Dryocoetes in fir was but a few days old and several newly attacked trees were recorded.

The extent of this infestation is not known; however, the area as seen from a boat on the lake covers several square miles. From the number of red-topped (1923 attacks) trees seen within this area, it is reasonably safe to assume, especially with the Engelmann spruce beetle, that the epidemic has materially decreased in the past year or two. However, it is believed that this outbreak will no doubt spread throughout the entire spruce stand, and if the limits of this type were not seen from the lake an epidemic condition may exist in other areas.

Recommendations

Control measures are not recommended at this time because of the following reasons:

1. The height of the Engelmann spruce beetle epidemic in the area viewed has undoubtedly passed.

2. Such a large per cent of the spruce and fir has been destroyed that an attempt to protect the remainder would not be justified.

3. The infested area is not on any main line of travel, and very few tourists ever see this portion of the park.

4. There is a good second story within the forest which insures a forest cover.

5. Considerable time would have to be spent by a trained entomologist during the spring and early summer in order to work out details as the method of locating infested trees, methods of treatment, most effective time for the work etc., before such a project could be instituted.

6. The spruce and fir which has been killed is for the most part very old and decadent, and the success of any control work would be very problematical.

However, it is recommended that if possible considerable attention be given to this outbreak during the coming season in order to define clearly its limits and the possibilities of its spread, which it is believed will be governed by the forest type. With this data available a different light may be placed upon this infestation relative to control.

DOUGLAS FIR BEETLE INFESTATION AT CAMP ROOSEVELT

Reference is made to a memorandum submitted from this station under date of September 4, 1924, to the superintendent of the Yellowstone National Park, covering in detail the Camp Roosevelt situation. This memorandum recommended the treatment of a number of Douglas fir trees around the Camp Roosevelt camp site which had been attacked during the past season by the Douglas fir beetle. The timber stand is in a healthy condition, there being no budworm defoliation, and it is believed that this little center of infestation is entirely separate from the thousands of trees which are being attacked in the spruce budworm area a few miles distant. In view of this fact and the value of the timber stands which surround theccamp, it is believed that the institution of control measures in an attempt to save the remaining trees is more than justified.